same mission,
new vision.

THE *future* OF THE DoD BUSINESS ENTERPRISE ARCHITECTURE

Office of the
DEPUTY CHIEF
MANAGEMENT OFFICER

"In the 21st century, modern armed forces simply cannot conduct high-tempo, effective operations without resilient, reliable information..."

— *Quadrennial Defense Review, 2010 February*

The **paradigm** shift.

END-TO-END GOVERNANCE *meets* SEMANTIC TECHNOLOGY.

The Department of Defense is the largest single consumer of information technologies in the United states, accounting for **nearly 50%** of the $80 billion dollars the country spends annually on such systems and services. (For more information, see www.itdashboard.gov/portfolios)

The establishment and use of an overarching **Business Enterprise Architecture (BEA)** was mandated in 2005 to help guide the acquisition and implementation of these systems. Historically, however, such guidance has been provided within the context of individual business systems rather then the Enterprise as a whole. The result has been redundancy, capability gaps, and poor interoperability across the more than 2000 individual business systems within the DoD.

In response to this problem, the DoD has championed the adoption of an End-to-End (E2E) business process framework in which the Department is considered as a single, interconnected entity. From individual business process, to policy compliance, to interoperability mandates, the E2E framework was adopted in the hopes of ensuring that system investment decisions would be made with the widest context and clearest vision of the Department possible.

While the adoption of the E2E framework is an important commitment and a necessary step, such a framework presents significant logistical, technological, and governance challenges in practice. And while the DoD's business architectures have developed over the past decade to more holistic approaches, these methodologies and technologies are, nonetheless, more than a decade old and can no longer keep pace with the rapidly changing needs and requirements of the modern day DoD.

What is the Business Enterprise Architecture (BEA)?

In 2005, the National Defense Authorization Act (NDAA) mandated the establishment and use of a BEA: An organizational system designed to provide overarching governance across all business systems, functions, and activities within the DOD.

It was designed with the intention to **guide**, **constrain**, and **permit** the implementation of interoperable business system solutions.

Thus, to fully support a true and effective E2E framework given the size, scope, and complexities of the modern DoD, a radically new approach— a paradigm shift — is needed. **Semantic Technologies and agile development are this paradigm shift.**

To successfully adopt an effective E2E business model, development processes must be:

✓ *Agile & Responsive:* Unlike last generation technologies that replicate information and silo them away in monolithic and proprietary warehouses, semantic technologies use modern, open standards to describe relationships between systems, leaving the original data— the authoritative data source — untouched and intact. Since these technologies are abstracted from the source data, relationships can be described incrementally without disturbing the operation of existing systems. This means that analytic capabilities can be built quickly, incrementally, and asynchronously from normal business operations:

✓ *Pervasively Federated:* This description of relationships ultimately leads to the development of information ontologies that can effectively map the complex interactions and interdependencies of the Departments business environment, providing an unprecedented contextual view of that environment.

While these technologies are new, they are not unproven. The DCMO has been successfully employing semantic technologies and agile development practices within a project known as the **Enterprise Information Web (EIW).** The success of the EIW program has spurred the initiative to adopt semantic technologies into the BEA.

While the mission of the BEA has not changed, the vision for its ultimate success has. Semantic technologies and agile development will combine to create a new BEA that has the transformational energy to fundamentally and pervasively empower a true end-to-end approach to business system investments throughout the Department.

Such a radical shift in approach will require a comprehensive implementation plan, pervasive support, and effective governance. This document outlines these pillars of transition to allay fears and to ensure the first steps of this revolutionary endeavor are confident, purposeful, and effective.

In order to reduce the cost and time of development, the Semantic BEA will leverage and reuse the tools, development methodology, configuration management process, and governance framework of the Enterprise Information Web.

The DCMO has piloted the use of semantic technologies, agile development, and operational governance for the past 18 months in a project known as **the Enterprise Information Web.** The mission of the EIW is to rapidly provide extensible, analytic capabilities supported by a federated information environment across the DoD Business Mission Area (BMA).

The EIW provides a mechanism for reaching into Authoritative Data Sources (ADS) and allows the DoD to report near real-time, authoritative information on-demand. The EIW also supports enterprise information standards, IT flexibility, and agility. This project represents a paradigm shift from the traditional capability development lifecycle by delivering analytic capabilities in 90-day increments versus 12, 18, or even 60 month periods.

Adherence to the W3C standards incorporated within the EIW enables the capabilities necessary to extend the EIW framework to support the development of the Semantic BEA.

1

Intro

E2E *meets* SEMANTIC TECHNOLOGY.

Introduction

The Department of Defense (DoD) Business Enterprise Architecture (BEA) is transforming to support End-to-End (E2E) governance and portfolio management in the DoD Business Mission Area (BMA). This transformation will include applying non-proprietary, open standards and protocols to architecture development, leveraging semantic web technologies, and adopting agile development methodologies.

The DoD recognizes that the current approach to investing in, building, and maintaining business information technology (IT) systems is both unmanageable and unsustainable. The governance of the BMA IT investments is exceedingly complex, resource-intensive, and lacks agility and flexibility. Finally, the current approach to portfolio management has not produced a sufficiently interoperable suite of business systems that provide best value business capabilities aligned to strategic management priorities.

To help address this, on April 4, 2011 the Deputy Chief Management Officer (DCMO) signed an Executive Memorandum titled "Use of E2E Business Models and Ontology in DoD Business Architecture" which calls for the transition to an E2E Governance Model for business IT investments and a transformation of the supporting approaches, methodologies, and technologies of the BEA.

The transition to an E2E governance model for business IT investments shifts the focus of decision-making and analysis to 15 E2E business processes and away from focusing on individual business system investments. It helps to ensure IT investment decisions are made with clear, contextual understandings of the positive and/or negative impacts to the DoD. It also helps to realize the benefits of business process re-engineering and portfolio management.

The Semantic BEA

This type of governance model, however, requires a different type of BEA. It requires an architecture that can support quick and factual analysis of the strategic, policy, and interoperability requirements of the Department's federated business environment. It also requires the adoption and practice of agile development processes that provide frequent opportunities to re-define and re-prioritize investments and perform impact analyses across the E2Es. The mission of the BEA outlined in United States Code Title 10, Section 222 remains unchanged:

"*Provide an enterprise architecture to cover all defense business systems, and the functions and activities supported by defense business systems, which shall be sufficiently defined to effectively guide, constrain, and permit implementation of interoperable defense business systems solutions and consistent with the policies and procedures established by the Director of the Office of Management and Budget.*"

However, the underlying approaches, methodologies, and technologies of the BEA will change in accordance with the 4 April 2011 DCMO memorandum.

More specifically, the BEA will transition to using non-proprietary, open standards and protocols managed and promulgated by international standards bodies like the World Wide Web Consortium (W3C) and the Object Management Group (OMG). The adoption of these non-proprietary standards and protocols will allow the Department of Defense to unambiguously describe and analyze, at a minimum, policies, business / system processes, data, systems, interfaces, system and business requirements, and performance metrics at both the OSD and Service level. Furthermore, these unambiguous descriptions will be human-readable, machine-readable, and executable. This will provide a deeper level of analytic capability that currently does not exist in the BEA. Ultimately, when a critical mass of unambiguous descriptions exist and a full range of information technology tools can read these descriptions, decision-makers, program managers and developers will have the information they need to invest in and create a suite of interoperable business systems of best value aligned to the Department's strategic goals and assembled at a fraction of the time and cost it takes today.

Rapid development of decision-grade analytics

The Semantic BEA will enable the rapid development of decision-grade analytics to support the investment decisions and strategic change management initiatives of the DoD. It will also provide the business context information required by the Department to guide and constrain system investments through a core set of analytic capabilities to include, but not be limited to:

Portfolio Management

Business Process Re-engineering

Interoperability Analysis

Performance Analysis

Policy Analysis

2 Benefits

TRANSITIONING TO THE SEMANTIC BEA WILL PROVIDE *unparalleled* BENEFITS TO BOTH THE DEPARTMENT AND STAKEHOLDERS.

Benefits at-a-glance

PROVIDING THE TOOLS TO *empower* THE BEA'S E2E MISSION

Optimized & Cost Effective

Decision makers and developers will have the information they need and IT systems will be assembled far less expensively and in a fraction of the time it takes today.

The DoD recognizes that the current approach to investing in, building, and maintaining business IT systems is both unmanageable and unsustainable.

End-To-End / Holistic Approach

This will allow the Department to analyze where information is created throughout the E2E process, where policies are being enforced, and which business processes are impacted by various changes. Under the Semantic BEA, the Department will have the ability to analyze business processes to whatever level necessary, including the exact requirements and implications for achieving system interoperability.

The Department has traditionally governed system investments and development activities on a system-by-system basis via the Joint Capability Integration Development System (JCIDS) and Defense Acquisition System (DAS). Designed for Weapon Systems, these approaches have not proven to be a natural means by which to govern the implementation of interoperable business systems.
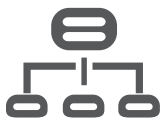
Semantic Technologies

The BEA will be described in an ontology using a common language based on World Wide Web Consortium (W3C) open standards—the Resource Description Framework (RDF) and the Web Ontology Language (OWL). This will allow the Department to seamlessly develop and\or extend the semantic descriptions of policies, business/system processes, data, systems, interfaces, system and business requirements and performance metrics at both the OSD and Service level. These technologies provide the inherent extensibility required to enable agile, incremental development of DoD business capabilities.

The current BEA does not adequately support agile development, detailed descriptions of systems, or the general extensibility required to produce the analytic capabilities to support the E2E governance model.

Rapid Development & Incremental Release

Analytic capabilities supported by the BEA will adhere to an incremental development process, to rapidly support the priorities and objectives of the Department.

Traditionally, the BEA has been developed and released on an annual basis. .

Proactive Role to Investments & Portfolio Management

The Department will have traceability to a program's development progress with a more granular level of detail. This will allow the Department to take a more proactive role with programs that fail to make consistent progress, as well as

1. Identify gaps within the current portfolio
2. Align gaps to Department objectives
3. Create system requirements to fulfill current gaps (if required), and
4. Monitor the development of programs tasked to eliminate particular gaps.

Currently, the DoD uses the BEA to vet investments on an annual basis, often with insufficient insight into program activities between annual reviews. In addition, the DoD currently lacks the portfolio visibility necessary to more proactively drive system requirements and investments.

Fact-Based Compliance

Compliance with the Semantic BEA is fact-based and provides traceability such that the Department can successfully and unambiguously verify architecture compliance.

In the past, Program Managers (PMs) have relied on self-assertion regarding compliance with the BEA. This did not foster a federated information environment.

Provides Accountability & Traceability

Developing the BEA process models using a semantic approach will enable the Department to identify key decision points between E2E processes. This development approach will identify these decision points and determine the proper authority. This will allow the Department to unambiguously hold the applicable parties accountable for particular decisions.
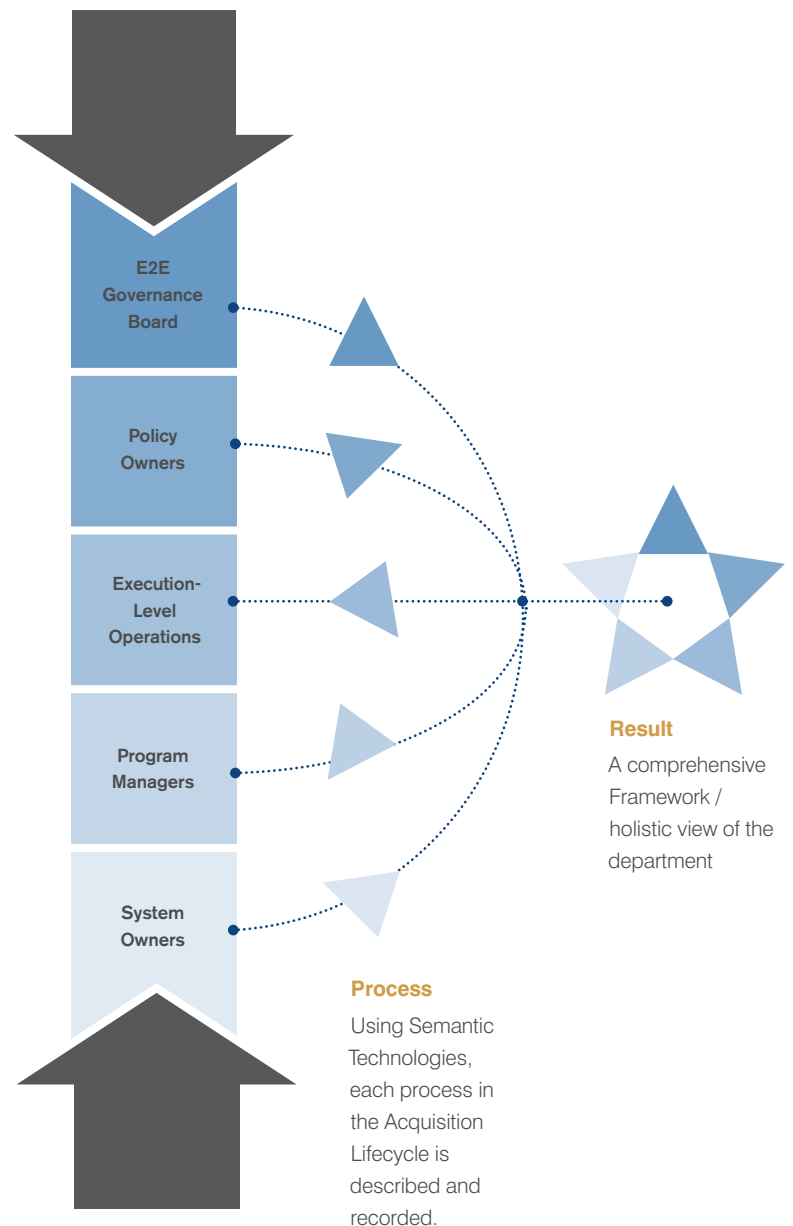
Because the current BEA is used for an Investment Management process constrained to system-by-system investment decisions, the authority of decision points between E2E processes is often times unclear

Seeing the **big** picture

Applying THE TOP-DOWN, BOTTOM-UP APPROACH

The Semantic BEA will provide a framework for describing and analyzing **E2E business processes** from the bottom-up and the top-down. It will also provide the newly formed E2E Governance Board and the Services with analytics for strategic decision-making based on facts.

To do this, the E2E business processes described in the Semantic BEA will provide the context of how the Department conducts business as a whole and will include the ability to drill-down into the supporting execution level business processes. This will create an environment that allows the Department to drill-down from a high-level E2E process into low-level operations and provide the capability to analyze where information is created throughout the E2E process, the policies being enforced, and the business processes that are impacted by various changes. Using the Semantic BEA, the Department will have the ability to analyze business processes at whatever level necessary including the exact requirements and implications for achieving system interoperability.

E2E Governance Board

Policy Owners

Execution-Level Operations

Program Managers

System Owners

Result

A comprehensive Framework / holistic view of the department

Process

Using Semantic Technologies, each process in the Acquisition Lifecycle is described and recorded.

A **common** language

SEMANTIC WEB TECHNOLOGIES *enable* E2E PROCESSES

Recently, international standards have emerged that produce the analytic capability necessary to support the E2E business model.

One family of standards, semantic web standards, are based upon technology invented by the Defense Advanced Research Projects Agency (DARPA) and managed and promulgated by the World Wide Web Consortium (W3C) today. These semantic web standards provide a common language with which virtually anything can be unambiguously described and thus analyzed across domains. These standards are designed for use at web-scale, meaning they will scale to the size of the DoD. These standards are based upon the concept of "open linked data" and are collectively known as the "Semantic Web", or "Web 3.0". **The critical W3C standards pertaining to the Semantic BEA are:**

RDF | OWL | R2RML | SPARQL

Resource Description Framework

Web-Ontology Language

Relational to RDF Mapping Language

SPARQL Protocol and RDF Query Language

Together these W3C semantic standards enable the unambiguous description of virtually anything into a query-able data structure. For more information, see www.w3c.org.

The other family of standards is based upon a universal way to build E2E business process models. This standard is called Business Process Modeling Notation (BPMN). Together with the aforementioned Semantic Standards, BPMN can enable a powerful analytic capability for business process engineering. The Semantic BEA will leverage open BPMN 2.0 standards, specifically the Analytics Conformance Class, to transition to an End-to-End framework for modeling, analyzing, and managing the BMA.

Insight & Transparency

THE *next* GENERATION OF PORTFOLIO MANAGEMENT

In the current environment, the Department uses the BEA to vet investments on an annual basis often with insufficient insight into program activities between annual reviews. In addition, the Department currently lacks the portfolio visibility necessary to more proactively drive system requirements and investments.

Utilizing the analytic capabilities supported by the Semantic BEA, the Department will have portfolio management capabilities that allow it to do the following activities with much greater frequency than is currently possible:

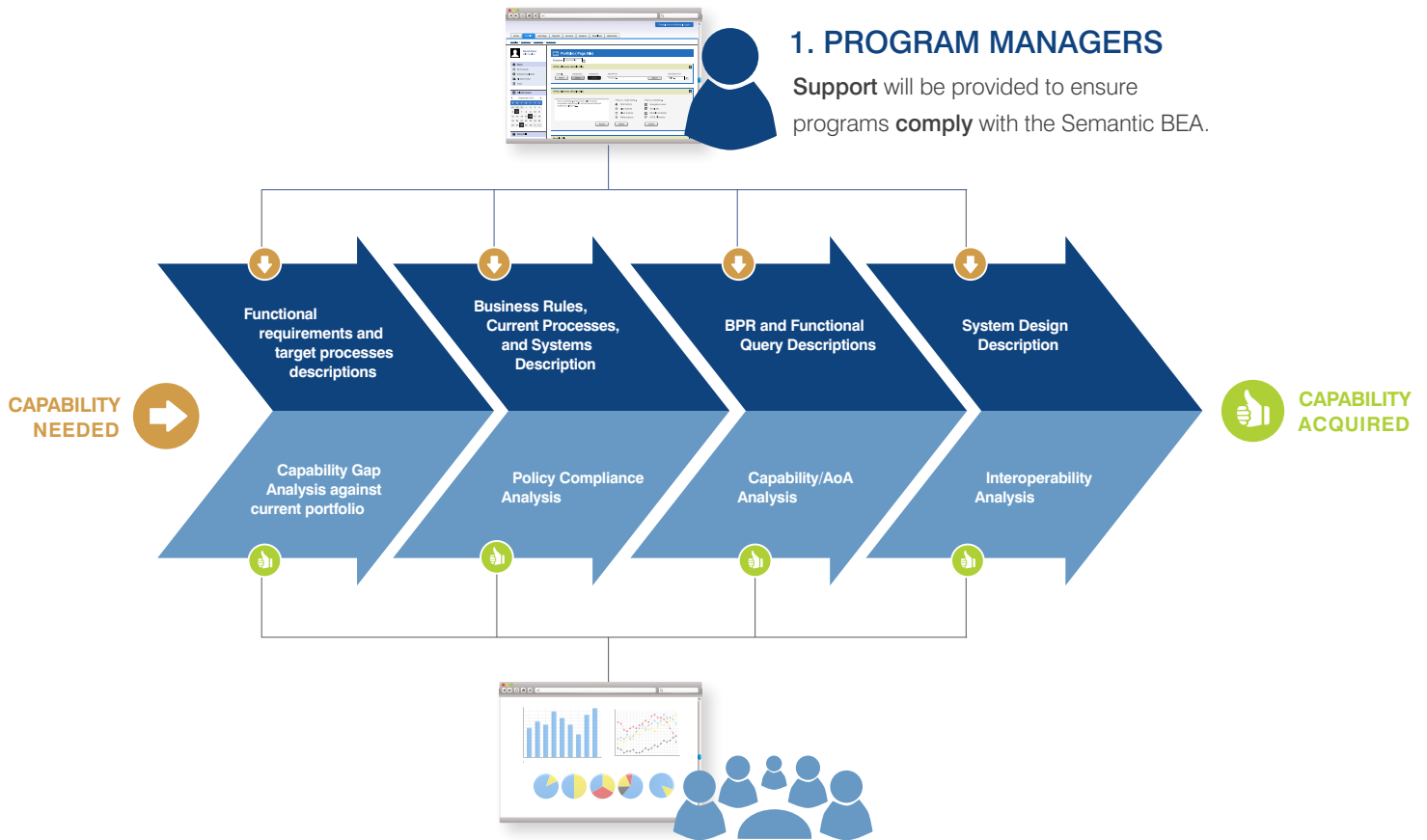| IDENTIFY	ALIGN	CREATE	MONITOR
Identify gaps and redundancies within current portfolios	Align gaps and redundancies to Department objectives	Create system requirements to fulfill current gaps and redundancies *(if required)*	Monitor the development of programs tasked to eliminate particular gaps and redundancies

In addition, the Semantic BEA will allow traceability of a program's development progress at a more granular level of detail. This will allow the Department to take a more proactive role with programs to ensure investments stay on track and aligned with stated goals and objectives. Program requirements and capabilities will be described in an open forum and published to the Department incrementally, rather than once a year. As the Semantic BEA continues to evolve, more descriptions will be available to meet ad-hoc analytic requirements necessary to guide and constrain investments in a timely and proactive manner.

A **phased** approach

SUPPORTING THE DEFENSE ACQUISITION LIFECYCLE

The Semantic BEA will provide a federated information environment that will allow various stakeholders throughout the Department to create data-rich analytic capabilities to meet their individual needs. It will also support **two important groups** within the Department:

1. PROGRAM MANAGERS

Support will be provided to ensure programs **comply** with the Semantic BEA.

CAPABILITY NEEDED

Functional requirements and target processes descriptions

Capability Gap Analysis against current portfolio

Business Rules, Current Processes, and Systems Description

Policy Compliance Analysis

BPR and Functional Query Descriptions

Capability/AoA Analysis

System Design Description

Interoperability Analysis

CAPABILITY ACQUIRED

2. E2E GOVERNANCE BOARD

The Semantic BEA will provide the **analytic capabilities** to contextually review programs with a clear understanding of positive or negative impacts for the department.

3 Capabilities

THE OUTCOME OF THE SEMANTIC BEA WILL BE THE *rapid development* OF DECISION GRADE ANALYTICS TO SUPPORT THE INVESTMENT DECISIONS AND STRATEGIC CHANGE MANAGEMENT INITIATIVES OF THE DOD.

The Semantic BEA will provide the context and relationships such that the Department can guide and constrain system investments through a core set of analytic capabilities to include, but not be limited to:

This dashboard will provide the ability to:

Assess whether or not the Department is transitioning to an interoperable systems environment

Analyze interoperability from a single program to a particular E2E process

Identify interoperability gaps within a particular end-to-end business process and prioritize investments necessary to resolve such gaps

1. Interoperability Analysis

A SYSTEM IS INTEROPERABLE IF IT HAS THE FOLLOWING PROPERTIES:

1. All of its interfaces are defined with enough precision so that other computer programs can use them simply by reading the description.

2. All of the data is defined with enough precision so that any program can use the data after reading the description of the data.

3. All descriptions of interfaces and data are created using OWL and RDF.

Definition derived from Jamie Popkin, "Taxonomies and Data Models: A Trip Through Parallel Universes"

Gartner Report, 17 June 2011

The Semantic BEA will focus on supporting an interoperable systems infrastructure at the IT and NSS level. Various architectures must be described with enough detail that relationships between them become visible. As such, the Semantic BEA will minimally describe interoperability on three levels: physical, functional, and semantic. The Semantic BEA ontology architecture will describe, in OWL, all required properties of a system to support analysis and evaluation of interoperability.

This dashboard will address, at a minimum, the following questions:

? Which systems interoperate with a given system?

? Which systems should a system interoperate with?

? What is the interoperability ratio for a particular domain/E2E?

? Which systems within a particular domain/E2E should interoperate with systems outside of that particular domain/E2E? Do these systems interoperate?

Interoperability is partially achieved through the agreement that all systems within a particular domain will map to a domain ontology (common vocabulary).

Primary Responsibilities:

DoD CIO

Create policy to establish a technical infrastructure that supports the physical exchange of messages between two or more systems.

PMs

Establish the functionality required for systems to send and receive messages and create, read, update, and delete particular data fields.

DoD DCMO

Establish a semantic infrastructure that supports the mapping of system interfaces to a common vocabulary as part of the BEA to enable interoperability analysis.

1 Physical

The system requirements such that systems can be integrated into the DoD Global Information Grid (GIG).

Examples include: specific protocols (TCP/IP, etc) as well as security requirements (SSL, ACAC, etc)

2 Functional

The system requirements allowing systems to create, read, update, and delete particular data fields.

Examples include: the http POST and GET, JDBC, SPARQL, ODBC, Java API, and SOAP.

3 Semantic

The ability for systems to utilize external data within the context of their current functionality by understanding how external data relates to their system schema.

Examples include: the W3C standards OWL, RDF, and Relation-to-RDF Mapping Language (R2RML).

Interoperability will be described on three levels.

This dashboard will provide the ability to:

Analyze whether or not particular DoD or Service-level policies are being enforced within a particular domain/E2E process.

Show how policies are related to business rules and how those business rules are related to system rules.

Give the Department the traceability required to analyze compliance.

2. Policy Analysis

THE ABILITY TO ANALYZE *relationships* BETWEEN OSD AND SERVICE-LEVEL POLICIES AND THE OVERALL DOD BUSINESS PORTFOLIO.

This includes the ability to guarantee that a policy is correctly implemented within each DoD component. It includes the automated validation of all policies through the execution of rules (expressed, at a minimum, as Rules Interchange Format (RIF) statements) defined at the OSD and Service level against authoritative data sources to determine compliance. These RIF statements should be translated into human-readable form, where applicable, using Semantics of Business Vocabulary and Business Rules (SBVR). Policy analysis also includes the ability to understand which policies impact particular business processes, systems, and organizations.

This dashboard will address, at a minimum, the following questions:

❓ Can current programs meet new policies?

❓ Are there capability gaps preventing the implementation of a policy?

❓ What is available to support implementation of a new policy?
(i.e. Organization of people, system, contract, etc.)

❓ Is the necessary data available/existing to evaluate compliance with a policy?

❓ How does a system align with the SMP/strategic metrics?

❓ Given a system, which policies does it comply with?

❓ Given a system, which policies should it comply with?

❓ Which systems are impacted by a given policy?

❓ Do business processes enforce the rules/regulations specified in a given policy? Where are the gaps?

❓ Does a policy conflict with existing policies? Is it supported by existing policies?

This dashboard will provide the ability to:

Analyze a particular target metric, KPI, or benchmark against authoritative data sources within the federated DoD architecture

Analyze relationships between metrics and related business processes, policies, and systems, and help analysts discover the source of poorly performing metrics, facilitating a potential business process re-engineering or process improvement activity

Drill down from a high-level metric or KPI down to the individual data records within a particular system

3. Performance Analysis

THE ABILITY TO *analyze* SPECIFIC TARGETED METRICS, BENCHMARKS, OR KEY PERFORMANCE INDICATORS (KPI) *against* BUSINESS PROCESSES AND AUTHORITATIVE DATA.

This type of analysis requires the ability to identify performance gaps within the Department and the content and relationships necessary to develop a resolution plan to address such performance gaps. The Semantic BEA will describe all required properties of target metrics, benchmarks, and KPIs necessary to analyze and evaluate performance measures.

This dashboard will address, at a minimum, the following questions:

❓ What is the progress of implementing a particular system?

❓ How are services or PMs performing compared to a particular target metric?

❓ What are the business processes which support a particular target metric?

❓ What policy is a particular target metric or KPI derived from?

❓ Which systems support a particular target metric or KPI?

❓ Which data records are linked to a poorly performing metric?

4. Portfolio Management Analysis

THE ABILITY TO ANALYZE THE CONTENT AND RELATIONSHIPS WITHIN A GROUP OF SYSTEMS, PROCESSES, AND POLICIES AND TO *understand* HOW INVESTMENTS AND PRIORITIES ALIGN WITH STRATEGIC OBJECTIVES.

This dashboard will provide the ability to:

Discover, analyze, and manage various components (processes, policies, systems) within a given E2E business process, including all required analytic capabilities such that the Department can transition the DoD business portfolio to a more efficient and cost-effective environment.

Analyze gaps within the E2E process, analyze the impact of a new system, policy, or process on the E2E process, identify inefficiencies within the E2E process, and reduce redundancies within an E2E process.

This requires, at a minimum, the ability to compare investments with strategic objectives, to identify and analyze gaps within the portfolio, to gauge the impact of a new system or policy, and to identify and analyze the progress of system modernization plans. The unambiguous description of, at a minimum, policies, processes, and systems within a particular E2E using the Semantic BEA is also required.

This dashboard will address, at a minimum, the following questions:

- ? Does a program meet the Department's goals (defined through metrics/policies)? Which program areas have gaps?

- ? Which systems will be sunset by a given ERP? Which systems (which data elements) will remain?

- ? What is the redundancy ratio for a given domain/E2E?

- ? Which business processes will be replaced by the current ERP? Does the ERP support all critical processes?

- ? Is a given system redundant with other systems/ERPs?

- ? Which analytics does a particular system support?

- ? What areas require additional funding? Which areas are priorities?

This dashboard will provide the ability to:

Identify and analyze gaps or inefficiencies within the current E2E business process (as part of the portfolio management capability)

Simulate and analyze a To-Be process

Analyze the impact of a To-Be process on the current E2E business process

5. Business Process Re-engineering Analysis

THE RESTRUCTURING OF *as-is* PROCESSES WITH THE GOAL OF INCREASING EFFICIENCY, AND STREAMLINING THE END-TO-END PROCESS.

This analytic capability is a natural by-product of interoperability analysis, policy analysis, and portfolio management. It facilitates the ability to analyze the potential impact of To-Be processes on current end-to-end business processes, compare business processes, and to simulate To-Be processes. The Semantic BEA will describe all required properties of a business or system process to support analysis and evaluation of BPR activities.

This dashboard will address, at a minimum, the following questions:

? How is the As-Is environment performing compared to a defined target metric? Why is it performing poorly?

? How will the To-Be process impact the current E2E process? Which business processes, policies, or systems will be impacted?

? Has a particular program completed the necessary BPR activities? What improvements has it made? What improvements should it make?

? Given an E2E process, where are the inefficiencies? Is it a capability gap or should a process be re-engineered?

? What is the progress of BPR efforts?

? Is the To-Be environment as streamlined and efficient as possible?

6. Acquisition Program Analysis

The rolled-up program view dashboard will give the Governance Boards access to high-level information regarding a particular program. This high-level information should address the general questions of the Department and will provide drill down capabilities to give access to more granular information surrounding a particular program.

This dashboard will address, at a minimum, the following questions:

- If it is a new program proposal, is development on schedule?
- If it is a modernization, is the modernization on schedule?
- If it is a system proposal or modernization proposal, is this a good investment?
- Is the program within the allocated budget?
- Where in the acquisition process is the program?
- What progress has been made since the last review?
- What enterprise priority does the given program support?
- Is this investment redundant with any previous and current investments?
- Is this program at-risk of cost or schedule breach?

7. General PM Analysis

The general Program/Project Management dashboard will provide program managers with access to information required to successfully develop, implement, and maintain a particular system.

This dashboard will address, at a minimum, the following questions:

- What policies must a program comply with?
- Does a program comply with all required policies?
- Does a program interoperate with the appropriate systems?
- What legacy systems does a program sunset?
- What other solutions should a program consider to prevent redundancies?

4

Execution

Agile Development

UTILIZING THE *Prove » Deploy » Adopt* METHODOLOGY

Traditionally, the BEA has been developed and released on an annual basis. Between annual releases, the BEA produces Informational Releases which reflect content updates, but are not used for compliance purposes until a full annual release. **The Semantic BEA will change this.**

Driven by the priorities and objectives of the Department, the Semantic BEA will be published incrementally and supported by training and guidance documentation. The analytic capabilities of the Department's BMA will increase proportionally to the completion of this framework. The entire Semantic BEA development process will be visible to all DoD stakeholders and the Semantic BEA releases will occur continuously throughout the year.

The semantic BEA will utilize a "Prove-Deploy-Adopt" development methodology — an iterative and sequential process that ensures capabilities are developed quickly and in support of the Department's E2E management philosophy.

PROVE
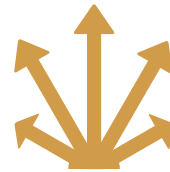
DEPLOY

ADOPT.

Prove.

Ensuring A CAPABILITY WORKS ON A PRACTICAL
LEVEL FOR EVERYONE ACROSS THE ENTERPRISE.

1 Document User Analytic Requirements

Develop requirement documents based on the priorities of the E2E Governance Board within the areas of portfolio management, policy analysis, interoperability analysis, business process re-engineering and performance analysis.
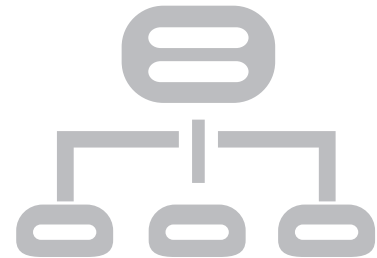
2 Develop Ontology Architecture

The incremental development of the Semantic BEA will be visible to all stakeholders so that the Department is aware of and can comment on upcoming changes

If necessary, the ontology architecture, or set of descriptions, will be extended. The development, release, and publishing of the ontology architecture will follow the Semantic BEA configuration management process. Once the ontology architecture has been developed, it will be:

Released and Utilized as part of the Business Process Area (BPA) and Proof of Delivery (PoD) process. Throughout the BPA and PoD process, the Semantic BEA ontology architecture will be modified to meet any new requirements. Incorporating the new Semantic BEA ontology architecture into the BPA process allows the newly modified ontology architecture to be 'tested' against service-level architectures before it is officially published to the Semantic BEA.

Published as part of the official Semantic BEA. The Semantic BEA will be published incrementally throughout the year, rather than an annual basis.

3 Develop Compliance and Governance Process

Extend the governance and compliance framework to ensure ontologies and mappings are developed in accordance to the Semantic BEA ontology architecture, as well as in accordance with the incremental BPA development approach.

4

Enhance Technology

There may be instances where the software architecture needs to be extended to support particular analytic requirements. This activity begins once a particular technology gap is identified.

5

Execute Business Process Area (BPA) Process

The BPA methodology describes small 'slices' of a particular E2E business process in an incremental fashion. The BPA approach scopes these descriptions based on specific analytic requirements intended to achieve defined business outcomes. It is comprised of the following high-level activities:
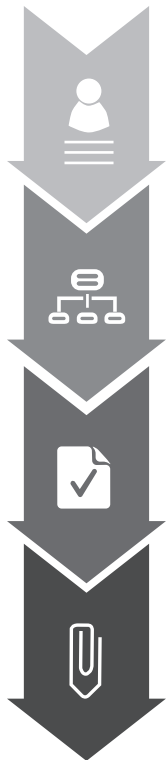
Develop User Scenarios. User scenarios document the specific functional requirements related to a particular BPA. These include, but are not limited to, data requirements, analytic capabilities, and general dashboard layouts. They are developed in coordination with various stakeholders to ensure that architecture development aligns with DoD and stakeholder priorities

Identify and Model Processes, Policies, Queries, and Data. DCMO architects and modelers collaborate with various stakeholders (utilizing the online discussion capabilities) to identify all processes, policies, queries, and data required to support a functional analytic capability. Once these artifacts have been identified, semantic architects from the DCMO work with stakeholders to describe architectures using the Semantic BEA ontology architecture.

Semantic Analysis and Validation. Throughout the BPA process, DCMO architects validate all architecture development. This activity ensures that the description of service-level architectures adhere to and comply with the standards defined within the Semantic BEA ontology architecture.

PoD Readiness. Once the service-level architecture has been validated, the BPA team includes all relevant information such that the BPA architecture descriptions can support analytic capabilities.

The BPA process is designed to engage the necessary stakeholders and Subject Matter Experts (SMEs) in semantically describing business processes, policies, and systems required to deliver an analytic capability
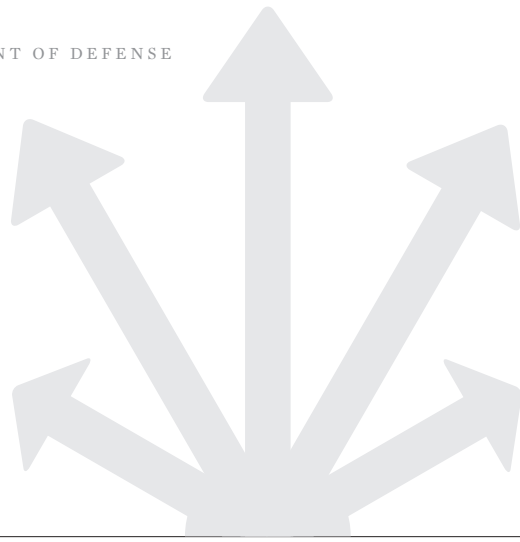
6

Implement and Deliver PoD

The PoD process delivers semantically-enabled analytic capabilities which leverage the user scenarios and executable semantic models developed as part of the BPA process. The Semantic BEA will include the delivery of analytic capabilities at least every 90 days.

Deploy.

MEASURE TWICE, CUT ONCE.

1 Perform End-to-End PoD testing

E2E testing is performed for all PoD capabilities. Any performance issues discovered during this testing will be logged and readied for resolution in the next development cycle.

2 Document Operational Requirements

Once a particular capability has passed the end-to-end testing phase, operational requirements for deploying this capability Department-wide will be documented. These requirements should include performance monitoring, a patching procedure, a recovery strategy, a backup strategy, and any other performance and operational related content.

3 Develop Adoption Plan

A formal adoption plan for deploying the capability Department-wide, including Information Assurance (IA), hosting, tool acquisition, and customer release plan requirements is then documented.

4 Implement Capability

The final activity is to deploy the capability Department-wide (based on the Operational Requirements and Adoption Plan). At this point, the ontology architecture and capability are considered ready for use by the Department.

Adopt.

PERVASIVE SUPPORT IS ESSENTIAL TO SUCCESSFUL ADOPTION

The Semantic BEA is a paradigm shift for the Department. As such, a significant amount of change management and communications will be involved as Stakeholders move along the change curve from Introduction to Adoption.

To aid in this transition, certain new roles and responsibilities will need to be defined and executed. These roles, at a minimum, include new governance roles, as well as organizational support to assist Stakeholders as they describe and validate the compliance of their architectures. This organizational support role will include the semantic skill set and DoD functional knowledge to guide, train, teach and otherwise assist Stakeholders. The DCMO recognizes that the transition to the Semantic BEA will be an ongoing process that will require educating and equipping decision-makers and "line workers" in order to be successful. The DCMO envisions providing support to the Stakeholders in measures required to transition to the Semantic BEA. This likely will include small teams of support available to Stakeholders as they participate in BPA activities to describe their architectures. In addition to these new support roles, effective guidance documentation as well as comprehensive training create a three tiered approach to ensure successful adoption of the Semantic BEA.

1 Document Guidance

Guidance documents which will help potential users effectively use the deployed capability will be developed. This could include basic setup and configuration, as well as any information related to the use of the capability. Changes to the Semantic BEA, as well as the steps required to assert compliance, will also be documented.

2 Develop Training

In addition to guidance, the Equipping The Workforce (ETW) program will be extended to include training on the new Semantic BEA ontology architecture. This training is to ensure that PMs and Services have the proper exposure and training such that they can effectively incorporate the new description requirements into their architectures.

3 Provide Customer Support

Once all activities have been completed, the BEA team will provide customer support to the Department. This is to ensure that those responsible for asserting compliance with the Semantic BEA have the necessary tools available.

Framework for **Success**

GOVERNANCE & COMPLIANCE: THE *keys* TO SUCCESSFUL ADOPTION

A formal governance process must be implemented to:

ENSURE
various stakeholders are describing their architectures in a timely manner

GOVERN
compliance with the Semantic BEA

ALIGN
the BEA with other Governance bodies, approval processes, and Congressional reporting

ENSURE
that the Department is transitioning to a more efficient business portfolio

The Semantic BEA governance framework will assure that a federated information environment will support decision grade analytics and should address, at a minimum, the following areas:

Requirements management. The Semantic BEA will be developed in accordance with the priorities and objectives of the Department. As such, the E2E Governance Board will identify and set the Department's E2E priorities; these priorities will drive the BPA and PoD development schedule.

Configuration management. The Semantic BEA will adopt an open development and incremental release schedule. Small 'slices' of the Semantic BEA will be published to the DoD community every few months, but all content being developed will be available to DoD stakeholders for comments.

Governing the day-to-day execution of the Semantic BEA. To ensure various groups throughout the DoD are making continuous progress in their description activities, a formal governance process will, at a minimum,

document and enforce a development schedule, assign the necessary tasks, and include a formal escalation process to address insufficient description progress. This governance process will include, but is not limited to, a formal workflow process, a formal organization chart for escalation purposes, and a formal architecture description schedule.
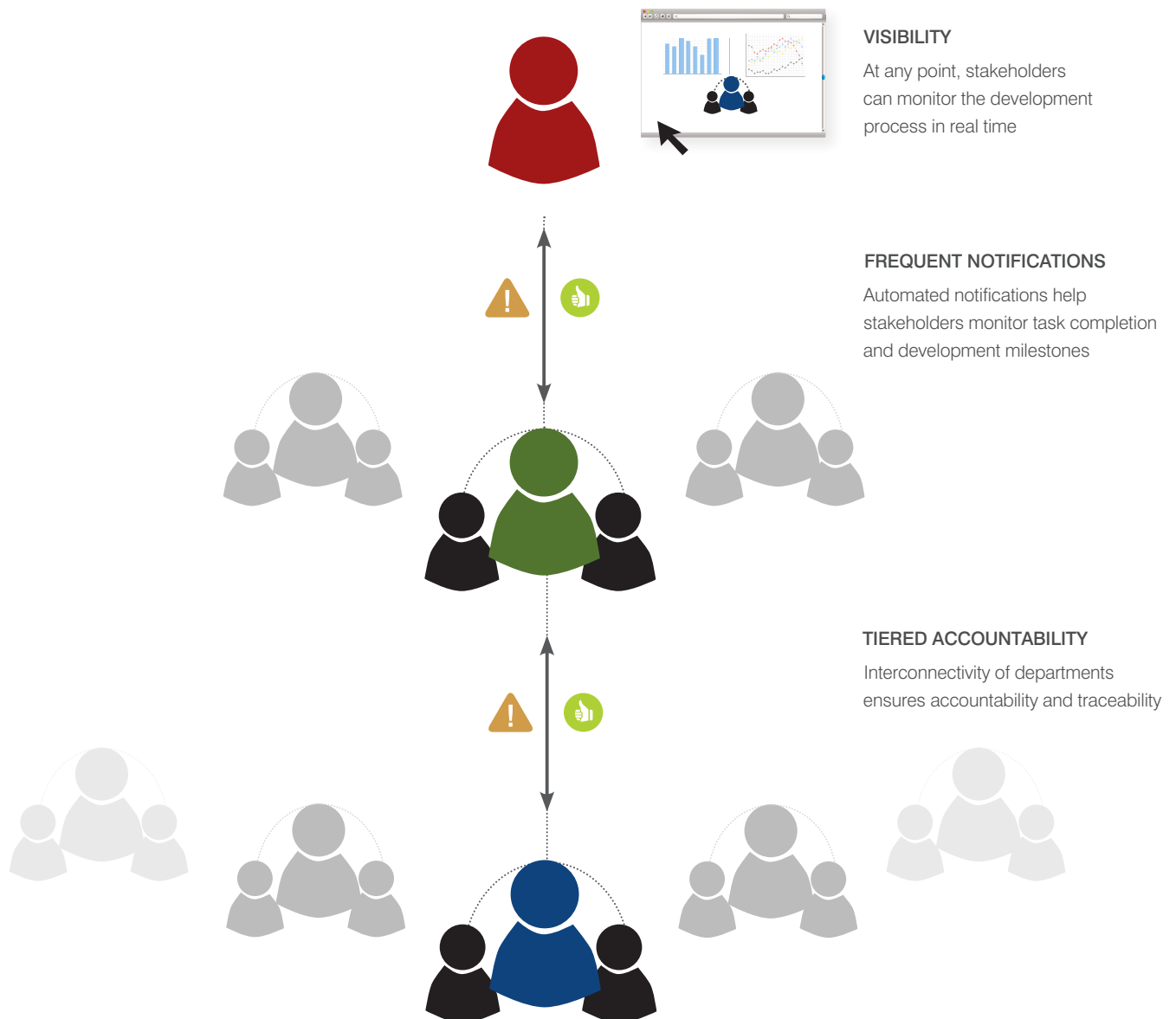
Governing compliance with the Semantic BEA. When architectures are not in compliance with the Semantic BEA, a formal governance process must identify and resolve these compliance gaps. This governance process will include, at a minimum, the identification of compliance gaps, the monitoring of resolution plans, and a formal escalation process to ensure compliance gaps are resolved in a timely manner.

The operational governance platform provides decision-makers visibility into the progress of development so they can quickly resolve issues. **Compliance with the Semantic BEA will be fact-based** and provide traceability such that the Department can successfully and unambiguously verify architecture compliance. Operational governance is the mechanism by which compliance will be facilitated and enforced.

VISIBILITY

At any point, stakeholders can monitor the development process in real time

FREQUENT NOTIFICATIONS

Automated notifications help stakeholders monitor task completion and development milestones

TIERED ACCOUNTABILITY

Interconnectivity of departments ensures accountability and traceability

Compliance Validation

Since the Department operates in a federated environment, it is crucial that members of the federation be able to validate the artifacts in other domains that they may use. Using a RIF-based compliance framework, each domain can validate architecture content as it is developed. When content passes the machine-based validations, then it is compliant with the BEA. These validation rules include, but are not limited to, the following:

Validate that the architecture description and mapping work complies with the W3C standards OWL, RDF, SPARQL, R2RML, and RIF. This validation activity ensures that architecture descriptions are developed in accordance with the semantic standards specified within the Semantic BEA.

Validate that the architecture description work aligns with the Semantic BEA ontology architecture. This validation activity ensures that the architecture description work complies with the ontology architecture and that there are proper mappings between the architectures and the domain ontology. This activity ensures that architectures are described with enough detail and utilize all of the required properties within the Semantic BEA in their descriptions.

Validate that the architecture meets all policy, interoperability, performance, and other requirements specified within the Semantic BEA. This validation step ensures that architectures comply with policies, performance, or other requirements described in the Semantic BEA. While the previous two validations ensure architecture compliance, this type of validation ensures compliance with particular DoD and Service-level policies, objectives and strategic initiatives. This would include, but is not limited to, compliance with target metrics, specific policy rules, and specific process rules as applicable to that federating architecture.

Appendix A

Acronyms

ADS	Authoritative Data Source	OMG	Object Management Group
BA	Business Area	OSD	Office of the Secretary of Defense
BEA	Business Enterprise Architecture	OWL	Web Ontology Language
BMA	Business Mission Area	P2P	Procure-to-Pay
BPA	Business Process Area	PM	Program Manager
BPMN	Business Process Modeling Notation	PoD	Proof of Delivery
BPR	Business Process Re-engineering	RDF	Resource Description Language
COE	Center of Excellence	RIF	Rules Interchange Format
DCMO	Deputy Chief Management Office	SBVR	Semantics of Business Vocabulary and Business Rules
DM2	DoDAF Meta Model		
DoD	Department of Defense	R2RML	Rational to RDF Mapping Language
E2E	End-to-End	SMP	Strategic Management Plan
EIW	Enterprise Information Web	SPARQL	SPARQL Protocol and Resource Query Language
GIG	Global Information Grid		
H2R	Hire-to-Retire	W3C	World Wide Web Consortium
IT	Information Technology		
JCIDS	Joint Capability Integration Development System		
KPI	Key Performance Indicator		
MDI	Model-Data-Implement		
NDAA	National Defense Authorization Act		
NSS	National Security Systems		